Advanced fibre characteristics
- by improving them with carbon nanotubes (CNT) -

Manuel Hahn*, Andreas Petr§, Robert Heider§, Johanne Hesselbach*, Silke Hampel§

* Faserinstitut Bremen e.V.; § Leibniz Institute for Solid State and Materials Research Dresden

1. Structure of Carbon Nanotubes

- Allotropes of carbon
- Cylindrical carbon molecules
- CNT are very mechanical stable, electrical conductive and corrosive resistant
- Used in nanotechnology, electronics, optics and other fields of material science

2. Growth of CNT by CVD Process

CNT growth on fibre by chemical vapour deposition (carbon source C₂H₂; temperature 750 °C)

Dip coating Potentiostatic deposition

Regular radial aligned CNT on fibre after electrochemical deposition of Co nanoparticles.

3. Possible Improvement: radial aligned CNT on carbon fibre (CF)

- Improvement of delamination resistance
- Enhancement of interlaminar fracture toughness
- Heat and electrical conductivity

4. Improvement of carbon fibre with Co Nanoparticles

- Catalyst nanoparticles (Co) on CF are needed for CNT growth
- Controlled deposition of Co nanoparticles with small diameter
- High density and regular arrangement is needed
- Best option: electrochemical deposition

5. Cotton

a) Deposition of CNT by Dip Coating

Dip coating of cotton in a CNT/tenside/solvent suspension

- Multi wall CNT with carboxy groups
- Controlled deposition of CNT controlled by dip time and dip quantity

b) Improvement of Cotton fibres with CNT

- Improved conductivity
- Improved mechanical properties
- Improved fire resistance
- Possible applications
  - Heating textiles
  - Smart textiles